Jefferson Medical College. It does not cover the ground of the usual laboratory manual of physics, but is intended to precede the use of any one of them in a course of physical measurements. It contains chapters on weights and measures, angles and circular functions, accuracy and significant figures, logarithms, small magnitudes, the slide rule, graphic representation, graphic analysis, the principle of coincidence, measurements and errors, statistical methods, deviation and dispersion, the weighting of observations, criteria of rejection, and least squares and various errors.

W. H. BUSSEY.

UNIVERSITY OF MINNESOTA.

Resistance of Materials. For beginners in Engineering. By S. E. SLOCUM, Professor of Applied Mathematics in the University of Cincinnati. Ginn & Company, Boston, 1914. $2.00.

The chief feature which distinguishes this volume from other American text-books on the same subject, as stated by the author in his preface, is that the principle of moments is used consistently throughout in place of the usual calculus processes.

The subject matter is presented in a clear and concise manner and is written so the book may be used by students at the same time they are taking courses in calculus or even before taking such courses. This feature makes the book available for trade or architectural schools where no calculus is taught.

The text has been divided into the following fourteen sections: stress and deformation; first and second moments; bending moment and shear diagrams; strength of beams; deflection of cantilever and simple beams; continuous beams; restrained or built-in beams; columns and struts; torsion; spheres and cylinders under uniform pressure; flat plates; riveted joints and connections; reinforced concrete; simple structures.

The author has used the principle of integration freely throughout the text dealing with the small parts, "elements," represented by Δ and using the symbol Σ instead of $\int$. Such a ratio as $\Delta M/\Delta x$ has been defined as the "rate of change," instead of the usual dM/dx of the calculus; also in finding the area of the moment diagram the expression $\Sigma M \cdot \Delta x$ replaces the $\int Mdx$ of the calculus.

Instead of deducing the equation of the elastic curve of a loaded beam and from it the slope and deflection at any section, the author has used for the deflection, $d = 1/EI$ (static moment of the moment diagram), and for the slope, $\tan \varphi = A/EI$, where A represents the area of the moment diagram between any two points in question. These equations give simple solutions in most cases. In dealing with the continuous beam and the restrained or built-in beam, the necessary formulas have been deduced by considering the effect of the loads acting separately. The sections dealing with torsion, spheres and cylinders under uniform pressure, and flat plates, contain the usual formulas for these cases.

The feature of the book that appealed most strongly to the reviewer was the

large number of well graded applications that have been included. The solving of these applications cannot fail to give the student a better understanding of the fundamentals involved and at the same time should tend to stimulate his interest in the subject.

WILLIAM A. JOHNSTON.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

PROBLEMS AND SOLUTIONS.

EDITED BY B. F. FINKEL AND R. P. BAKER.

PROBLEMS FOR SOLUTION.

ALGEBRA.

438. Proposed by WALTER C. EELLS, U. S. Naval Academy, Annapolis, Maryland.

In Hardy's *Pure Mathematics* (page 14, Nos. 2, 3) occurs the problem: "Show that if m/n is a good approximation to $\sqrt{2}$, then $(m+2n)/(m+n)$ is a better one, and that the errors in the two cases are in opposite directions, *e. g.*, 1/1, 3/2, 7/5, 17/12, 41/29, 99/70, $\cdots$." Find (*a*) other approximations for $\sqrt{2}$ of same type, *i. e.*,

$$\frac{m'}{n'}=\frac{am+bn}{cm+dn}, \qquad (a,\ b,\ c,\ d,\ m,\ n,\ \text{integers}).$$

(*b*) Similar approximations for the square roots of other integers.

439. Proposed by A. M. KENYON, Purdue University.

If k, n are natural numbers, $n > 2k$, show that

$$\frac{2^k}{\underline{|k}}\sum_{i=0}^{I\left(\frac{n+1}{2}\right)}\frac{1}{\underline{|2i+1}\,\underline{|n-k-2i}}=\frac{2^n}{\underline{|n+1}}\sum_{i=0}^{k}\binom{n-i}{n-k},$$

where $I(n/2)$ denotes the integral part of $n/2$ and $\binom{n}{k}$ is the coefficient of x^k in $(1+x)^n$.

440. Proposed by W. D. CAIRNS, Oberlin College.

n being a positive integer, find the sum of the series

$$n^2+4(n-1)^2+2(n-2)^2+4(n-3)^2+2(n-4)^2+\cdots, \tag{1}$$

where the succeeding coefficients are alternately 4 and 2; or, more generally, the series

$$an^2+b(n-1)^2+a(n-2)^2+b(n-2)^2+b(n-3)^2+\cdots. \tag{2}$$

L'Intermédiaire, July, 1913.

GEOMETRY.

469. Proposed by W. F. FLEMING, Chicago, Ill.

A pole whose length is l stands vertically against a vertical wall. A spider is at each end of the pole. The pole is drawn out from the wall in such a way that its upper end moves down the wall at a uniform rate. At the same time that the pole begins to move, the spiders begin to travel toward each other at rates equal to the rates at which the respective ends move. Determine the equations of the paths of the two spiders, in space.

470. Proposed by ROBERT E. MORITZ, University of Washington.

Prove that

$$\theta=\left(\lambda+\frac{q}{p}\mu\right)\pi, \qquad (\lambda=1,\ 2,\ 3,\ \cdots,\ q-1;\ \mu=0,\ 1,\ 2,\ \cdots,\ p-1)$$